62.

$y = 37 \sin\left(\frac{2\pi}{365}(x-101)\right) + 25$

x = time (days)

y = Temp (ave daily)

a) what day is temp increasing fastest (biggest roc)

$y' = \frac{2\pi}{365} \cdot 37 \cos\left(\frac{2\pi}{365}(x-101)\right)$ max of this when $x = 101$

rate of change of temp

roc

$y'(101) = .637 \frac{°}{day}$

Sep 24-8:55 AM

49. $x = t^2 + t \qquad y = \sin t$

a) $\frac{dy}{dx} = \frac{\cos t}{2t+1}$ $\left(\frac{\frac{dy}{dt}}{\frac{dx}{dt}}\right)$

b) $\frac{d}{dt}\left(\frac{dy}{dx}\right) = \frac{(2t+1)(-\sin t) - \cos t \cdot 2}{(2t+1)^2}$

c) $\frac{d}{dx}\left(\frac{dy}{dx}\right) = \frac{\frac{d}{dt}\left(\frac{dy}{dx}\right)}{\frac{dx}{dt}} = \frac{(2t+1)(-\sin t) - 2\cos t}{(2t+1)^3}$

Sep 24-9:41 AM

3.7a Implicit Differentiation

differentiate: Find $\frac{dy}{dx}$

$y = 1 - x^2$ explicit

$\frac{dy}{dx} = -2x$

$\frac{dx}{dx} = 1$

$\frac{dy}{dy} = 1$

$x^2 + y = 1$ Implicit

$2x + \frac{dy}{dx} = 0$ $\frac{dy}{dx} = -2x$

$y^2 = x$

$2y \cdot \frac{dy}{dx} = 1$

$\frac{dy}{dx} = \frac{1}{2y}$

explicit $y = \sqrt{x} = x^{\frac{1}{2}}$

$\frac{dy}{dx} = \frac{1}{2} x^{-\frac{1}{2}}$

$= \frac{1}{2} \frac{1}{x^{1/2}}$

$= \frac{1}{2\sqrt{x}} = \frac{1}{2y}$

Sep 28-5:35 PM

Find the slope of the circle at the point (3,-4)

$x^2 + y^2 = 25$

$2x + 2y \cdot y' = 0$

$2y \cdot y' = -2x$

$y' = \frac{-2x}{2y} = \frac{-x}{y}\Big|_{(3,-4)} = \frac{-3}{-4} = \frac{3}{4}$

Sep 28-5:46 PM

Implicit Differentiation Process

1. Differentiate both sides of the equation with respect to *x*. term by term
2. Collect the terms with *dy*/*dx* on one side of the equation
3. Factor out *dy*/*dx*.
4. Solve for *dy*/*dx*.

Sep 28-5:54 PM

lens, tangents and normal lines

find the tangent and normal lines to the ellipse at the point (-1,2)

$x^2 - xy + y^2 = 7$

$2x - (xy' + y \cdot 1) + 2yy' = 0$

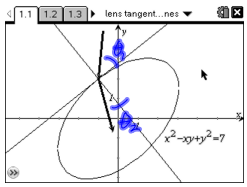
$2x - xy' - y + 2yy' = 0$

$-xy' + 2yy' = -2x + y$

$y'(-x + 2y) = -2x + y$

$y' = \left.\frac{-2x+y}{-x+2y}\right|_{(-1,2)} = \frac{2+2}{1+2\cdot 2} = \frac{4}{5}$

tan line: $y = \frac{4}{5}(x+1)+2$ normal: $y = -\frac{5}{4}(x+1)+2$



Sep 28-5:50 PM

higher order derivatives

Find the second derivative of *y* with respect to *x*

$2x^3 - 3y^2 = 8$

$6x^2 - 6yy' = 0$

$y' = \frac{-6x^2}{-6y} = \frac{x^2}{y}$

$y'' = \frac{y \cdot 2x - x^2 \cdot y'}{y^2} = \left[\frac{2xy - x^2 \cdot \frac{x^2}{y}}{y^2}\right] y$

$y'' = \frac{2xy^2 - x^4}{y^3}$

Sep 28-6:12 PM